

Programming paradigms 1

Evaluation: primitive procedures

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Outline

1 +

2 (+ 1 2)

3 (+ 1 (+ 1 1))

4 (+ 1 + 1 1)

5 (+ 1)

6 (+)

7 ((+))

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

Outline

1 +

2 (+ 1 2)

3 (+ 1 (+ 1 1))

4 (+ 1 + 1 1)

5 (+ 1)

6 (+)

7 ((+))

(+ 1 2)

Eval[(+ 1 2), \mathcal{P}_G] = ...

(+ 1 2)

$\text{Eval}[(\textcolor{blue}{+} \textcolor{green}{1} \textcolor{green}{2}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

(+ 1 2)

$\text{Eval}[(\textcolor{blue}{+} \textcolor{green}{1} \textcolor{green}{2}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

(+ 1 2)

$\text{Eval}[(+ \textcolor{blue}{1} \textcolor{green}{2}), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

$\text{Eval}[\textcolor{green}{2}, \mathcal{P}_G] = \textcolor{green}{2}$

(+ 1 2)

$\text{Eval}[(\textcolor{blue}{+} \textcolor{green}{1} \textcolor{green}{2}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

$\text{Eval}[\textcolor{green}{2}, \mathcal{P}_G] = \textcolor{green}{2}$

$\text{Apply}[\textcolor{teal}{\text{'pr. proc. of sum.'}}, \textcolor{green}{1}, \textcolor{green}{2}] = 3$

Outline

1 +

2 (+ 1 2)

3 (+ 1 (+ 1 1))

4 (+ 1 + 1 1)

5 (+ 1)

6 (+)

7 ((+))

(+ 1 (+ 1 1))

Eval[(+ 1 (+ 1 1)), \mathcal{P}_G] = ...

$(+ 1 (+ 1 1))$

$\text{Eval}[(+ 1 (+ 1 1)), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$(+ 1 (+ 1 1))$

$\text{Eval}[(+ 1 (+ 1 1)), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$(+ 1 (+ 1 1))$

$\text{Eval}[(+ 1 (+ 1 1)), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Eval}[(+ 1 1), \mathcal{P}_G] = \dots$

$(+ 1 (+ 1 1))$

$\text{Eval}[(+ 1 (+ 1 1)), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Eval}[(+ 1 1), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$(+ 1 (+ 1 1))$

$\text{Eval}[(+ 1 (+ 1 1)), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Eval}[(+ 1 1), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$(+ 1 (+ 1 1))$

$\text{Eval}[(+ 1 (+ 1 1)), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Eval}[(+ 1 1), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$(+ 1 (+ 1 1))$

$\text{Eval}[(+ 1 (+ 1 1)), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Eval}[(+ 1 1), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Apply}[\text{'pr. proc. of sum.'}, 1, 1] = 2$

$(+ 1 (+ 1 1))$

$\text{Eval}[(+ 1 (+ 1 1)), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Eval}[(+ 1 1), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Eval}[1, \mathcal{P}_G] = 1$

$\text{Apply}[\text{'pr. proc. of sum.'}, 1, 1] = 2$

$\text{Apply}[\text{'pr. proc. of sum.'}, 1, 2] = 3$

Outline

1 +

2 (+ 1 2)

3 (+ 1 (+ 1 1))

4 (+ 1 + 1 1)

5 (+ 1)

6 (+)

7 ((+))

(+ 1 + 1 1)

Eval[(+ 1 + 1 1), \mathcal{P}_G] = ...

(+ 1 + 1 1)

$\text{Eval}[(+ \textcolor{blue}{1} \textcolor{green}{+} \textcolor{blue}{1} \textcolor{green}{1}), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

(+ 1 + 1 1)

$\text{Eval}[(+ \textcolor{blue}{1} \textcolor{green}{+} \textcolor{green}{1} \textcolor{green}{1}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{red}{1}$

(+ 1 + 1 1)

$\text{Eval}[(+ \textcolor{blue}{1} + \textcolor{green}{1} \textcolor{green}{1}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

(+ 1 + 1 1)

$\text{Eval}[(+ \textcolor{blue}{1} + \textcolor{green}{1} \textcolor{green}{1}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

(+ 1 + 1 1)

$\text{Eval}[(+ \textcolor{blue}{1} \textcolor{green}{+} \textcolor{green}{1} \textcolor{green}{1}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

(+ 1 + 1 1)

$\text{Eval}[(+ \textcolor{blue}{1} \textcolor{green}{+} \textcolor{green}{1} \textcolor{green}{1}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

$\text{Eval}[\textcolor{green}{1}, \mathcal{P}_G] = \textcolor{green}{1}$

$\text{Apply}[\text{'pr. proc. of sum.'}, \textcolor{green}{1}, \text{'pr. proc. of sum.'}, \textcolor{green}{1}, \textcolor{green}{1}] =$

(+ 1 + 1 1)

`Eval[(+ 1 + 1 1), PG] = ...`

`Eval[+, PG] = 'pr. proc. of sum.'`

`Eval[1, PG] = 1`

`Eval[+, PG] = 'pr. proc. of sum.'`

`Eval[1, PG] = 1`

`Eval[1, PG] = 1`

`Apply['pr. proc. of sum.', 1, 'pr. proc. of sum.', 1, 1] =`

Error: The procedure was applied with other arguments than numbers.

Outline

1 +

2 (+ 1 2)

3 (+ 1 (+ 1 1))

4 (+ 1 + 1 1)

5 (+ 1)

6 (+)

7 ((+))

(+ 1)

$\text{Eval}[(\textcolor{blue}{+} \textcolor{green}{1}), \mathcal{P}_G] = \dots$

(+ 1)

$\text{Eval}[(+ \textcolor{blue}{1}), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

(+ 1)

$\text{Eval}[(+ \textcolor{blue}{1}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{blue}{1}, \mathcal{P}_G] = \textcolor{blue}{1}$

(+ 1)

$\text{Eval}[(+ \textcolor{blue}{1}), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[\textcolor{blue}{1}, \mathcal{P}_G] = \textcolor{blue}{1}$

$\text{Apply}[\text{'pr. proc. of sum.'}, \textcolor{blue}{1}] = \textcolor{blue}{1}$

Outline

1 +

2 (+ 1 2)

3 (+ 1 (+ 1 1))

4 (+ 1 + 1 1)

5 (+ 1)

6 (+)

7 ((+))

(+)

$\text{Eval}[(\textcolor{blue}{+}), \mathcal{P}_G] = \dots$

(+)

$\text{Eval}[(+), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

(+)

$\text{Eval}[(+), \mathcal{P}_G] = \dots$

$\text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Apply}[\text{'pr. proc. of sum.']} = 0$

Outline

1 +

2 (+ 1 2)

3 (+ 1 (+ 1 1))

4 (+ 1 + 1 1)

5 (+ 1)

6 (+)

7 ((+))

((+))

Eval[((⁺)), \mathcal{P}_G] = ...

((+))

$\text{Eval}[(\textcolor{blue}{(+)})], \mathcal{P}_G] = \dots$

$\text{Eval}[(\textcolor{blue}{+})], \mathcal{P}_G] = \dots$

((+))

$\text{Eval}[(\textcolor{blue}{+}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

((+))

$\text{Eval}[(\textcolor{blue}{+}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Apply}[\text{'pr. proc. of sum.'}] = 0$

((+))

$\text{Eval}[(\textcolor{blue}{+}), \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \dots$

$\text{Eval}[\textcolor{blue}{+}, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Apply}[\text{'pr. proc. of sum.'}] = 0$

Error: The first element did not evaluate to proc. or spec. form.